Instruction Manual for

An Expansion Interface for the VIC-20®

"CARDBOARD/6" - INSTRUCTION MANUAL

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67226

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WARNING #1
****

NEVER ATTEMPT TO INSTALL OR REMOVE THE "CARDBOARD/6", OR CARTRIDGES FROM/TO THE "CARDBOARD/6", WITHOUT FIRST TURNING OFF THE VIC-20 POWER SWITCH.

WARNING #2
****

THIS UNIT IS DESIGNED TO USE ONLY COMMODORE APPROVED CARTRIDGES. CARDCO, INC., WILL NOT BE RESPONSIBLE FOR ANY DAMAGE OR PROBLEMS CAUSED BY THE USE OF NON-APPROVED DEVICES.

"CARDBOARD/6" - INSTRUCTION MANUAL

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THE "CARDBOARD/6" IS A PRODUCT OF CARDCO INC. OF WICHITA, KS.

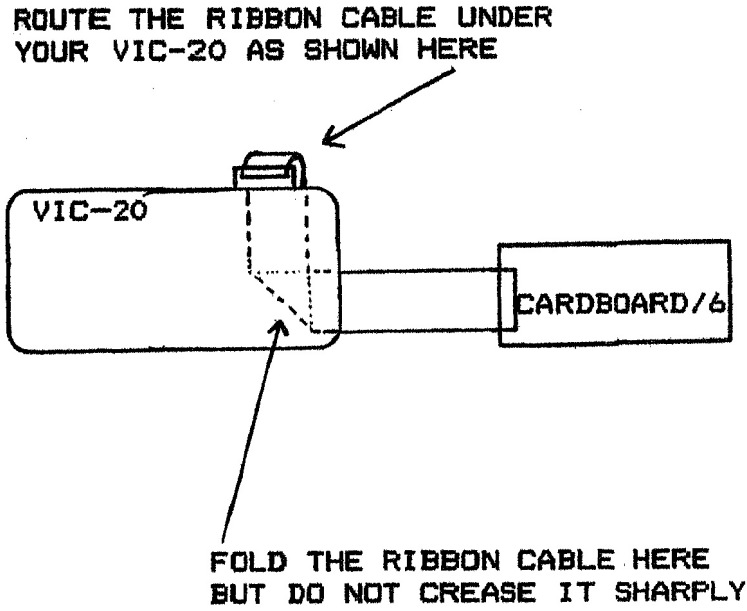
ROUTE THE RIBBON CABLE UNDER
YOUR VIC-20 AS SHOWN HERE
VIC-20
CARDBOARD/6
FOLD THE RIBBON CABLE HERE
BUT DO NOT CREASE IT SHARPLY

FIGURE # 1
****

Well, you bought it! What do you do with it?

****

To start you off in the right direction, turn off your VIC-20 and plug the connector in the back of your VIC into the same place you would normally plug a game cartridge. This may be a bit tricky. Be sure you have the ribbon connector side up when you plug it in. Center the card carefully then firmly push it into position.

Now study figure #1 carefully. Route the cable as shown, UNDER YOUR VIC, then put the "CARDBOARD/6" next to your VIC, as in the drawing. Now you are ready to go on to bigger and better things.

The next thing you will probably want to do is plug in all those cartridges you have been saving. O.K! Go for it. Don't worry about what goes where ---------- the "CARDBOARD/6" doesn't care. Now turn all of the dip switches off and read on.

WARNING: There are two cartridges that won't work on the board at the same time. The 3k RAM (VIC-1210) and the SUPER EXPANDER (VIC-1211A). If you have both of these sell the 3k to someone else because you won't be needing it.

NOTE: If you have more than one 8k RAM (VIC-1110) or 16k RAM (VIC-1111) be sure none of the internal dip switches are set to the same position. (For instructions on how to set the internal dip switches, please read the sheet of information that came in the box with your 8 or 16k RAM.) For example: normal settings of the switches would have them in descending order, starting with 4, then 3, then 2, then 1, if you have that many.

IDEA: It might be a good idea to write the name of the cartridge on top of the cartridge on a piece of tape, so you don't forget what is where.

O.K. What do I do next?

****

What to do next depends on what you want to use the "CARDBOARD/6" for. And before you can decide that, you are going to have to learn a little bit about your VIC-20.

Now it's time for a little tech-talk, but I will try to make it as painless as possible.

"CARDBOARD/6" - INSTRUCTION MANUAL

The "CARDBOARD/6" provides six exact duplicates of the memory expansion port in the back of your VIC. For the most part, you will only be interested in making use of the reset line and the memory select lines. The rest of the lines will take care of themselves. (For those of you who "must know", I would suggest reading the VIC Programmer's Reference (VM-110), if you are lucky enough to find one.) The "CARDBOARD/6" allows it's user increased access to some of the VIC-20's memory select, data, i/o and interrupt lines.

THE RESET BUTTON
****

Let's start easy, with the reset line. If you have set the "CARDBOARD/6" up as we mentioned earlier, look for the square push button toward the left rear of the board. (Yes, Matilda, it is the only push button on the board.) This is the RESET button. It is connected to the reset line (that makes sense). The RESET button will have almost the same effect as turning your VIC off and then on again. It will erase all RAM memory in the user basic area (this includes any basic and/or machine language programs in memory accessable by basic), so USE IT WITH CAUTION!!! Programs not in the user basic area will remain (ie. BLK #5, or deselected BLKs 1, 2 or 3.)

Using the RESET will save a lot of wear and tear on not only your VIC, but also on your TV set. The reset also has one very nice use when you are playing a game on a plug-in cartridge--it will cancel a game in progress and restart the game. (My favorite use for this feature is when I'm playing Avenger, and my first laser base gets blasted before I knock out the first group of Invaders. Why waste time on a lost cause? This action is similar to conceding a chess game, after the early loss of one's Queen, by dumping over the chess board.)

The most valuable feature of the "CARDBOARD/6" (in our opinion) is it's ability to switch select memory address lines. Great, but what does that mean?

RANDOM ACCESS MEMORY.....(RAM)

Random access memory (RAM for short) is the type of memory that you will use to store your programs. It is "volatile", which means it can be erased. It can be changed or altered, as you wish. For example, if you poke a RAM location (POKE 4099,117), then peek at it (? PEEK (4099)), you will get back what you put in. But if you turn power off and on again, your number will be gone. So RAM changes as you instruct it to store your programs and data.

There are seven blocks or areas of memory that are not used by the internal workings of your VIC-20. These blocks are made available to the user through the memory expansion port (remember, the place where you plug in games, etc.). The "CARDBOARD/6" is an extension of that expansion port.

The seven memory blocks are:

RAM 1) These three blocks are usually
RAM 2) treated as one unit. Each is 1k in
RAM 3) size and they are located below the internal 5k of RAM that is included with the VIC-20.

BLK 1) This is the first 8k expansion area.

BLK 2) This is the 2nd 8k expansion area.

BLK 3) This is the 3rd 8k expansion area.

BLK 5) This is the last 8k expansion area.

NOTE: Refer to mini-memory-map, figure #2.

MINI MEMORY MAP

DECIMAL ADDRESS	HEX ADDRESS	INTERNAL VIC MEMORY RAM/ROM LOCATIONS	ACCESSED VIA MEMORY EXPANSION PORT
0000 TO 0928	$0000-$033B	ZERO PAGE & WORKING RAM	
0928 1023	$033C $03FF	CASSETTE BUFFER	
1024 4095	$0400 $0FFF		3K EXPANSION RAM RAM#1,RAM#2,RAM#3
4096 8191	$1000 $1FFF	INTERNAL USER RAM & SCREEN RAM	
8192 16383	$2000 $3FFF		8K EXPANSION RAM BLK # 1
16384 24575	$4000 $5FFF		8K EXPANSION RAM BLK # 2
24576 32767	$6000 $7FFF		8K EXPANSION RAM BLK # 3
32768 36863	$8000 $8FFF	CHARACTER GENERATOR ROM	
36864 40959	$9000 $9FFF	VIC CHIP, I/O & COLOR RAM	
40960 49151	$A000 $BFFF		8K EXPANSION RAM BLK # 5
49152 65535	$C000 $FFFF	KERNAL ROUTINE AND BASIC INTERPRETER ROM.	

FIGURE # 2
****

As you may have noticed, the 8k Blocks are numbered 1, 2, 3, 5. What happened to #4 ??? Well, Commodore decided to use that location for some internal workings, and thereby made it unavailable for us to use. This also puts BLK 5 in an awkward position, because basic only "sees" memory that is in a continuous string; BLK 5 cannot be used for basic programming, because it is separated from the rest of the RAM blocks by BLK 4. But not to worry--if you put an 8k RAM cartridge there, it is still useable as a storage area for machine language programs. When stuff is stored up there, it is very safe, because basic cannot overwrite it. In fact, the only way to get at it is with a "SYS" command or a "PEEK" or "POKE". More on that later.

If you have an 8k RAM in BLK 1 and a 3k or or super expander in RAM 1, RAM 2, and RAM 3 memory areas, these RAM blocks also become unuseable for basic programming because it is separated from the rest of basic ram by the screen ram (the area of ram the VIC-20 uses to store the information on the screen). And it, just like BLK #5, becomes useable for machine language programming only.

Have I got you confused yet?

THE MYSTERIOUS MOVING SCREEN

****

Now is the time to tell you about "THE MYSTERIOUS MOVING SCREEN"! You may have been warned by some (tape-based) software suppliers that "THIS PROGRAM WILL ONLY RUN ON VIC-20's WITH NO ADDITIONAL MEMORY INSTALLED", or you may have tried to load a program from a tape when you had your 8k RAM cartridge in place and found it didn't work, or had some really weird goings-on happening on the screen. The reason is that when you put the 8k RAM in the VIC-20's BLK 1 location and turned on the VIC, the screen RAM is moved to a new position. (Refer to figure 3 to see what happens.)

A well written program will not be affected by the amount of memory you have, but for those of you who own some poorly written programs, and for those of you who want to write good programs we offer these solutions to the problem.

THE MYSTICAL MOVING SCREEN

****

VIC-20 VIDEO RAM MEMORY MAP

MEMORY LOC HEX	DEC	WITH LESS THAN 8K OF RAM	WITH 8K OR MORE OF RAM ADDED
$0400	1024	START OF BASIC WITH 3K EXP. RAM.	
$1000	4096	START OF BASIC WITH NO EXP. RAM.	START OF SCREEN MEMORY
$1200	4608		SYART OF BASIC
$1E00	7680	START OF SCREEN	
$1FFF	8191	END OF MEMORY	END INTERNAL RAM
$3FFF	16383		END BLK # 1 RAM
$5FFF	24575		END BLK # 2 RAM
$7FFF	32767		END BLK # 3 RAM
$9400	37888		START COLOR RAM
$9600	38400	START COLOR RAM	

FIGURE # 3

****

SOLUTION #1. Locate the two dip switch groups at the left front of the "CARDBOARD/6". Notice that one group has six switches and one group has seven (refer to figure 4). The odd seventh switch controls the VIC's access to RAM BLK 1. If the VIC "sees" RAM in this location, it will automatically move the screen. If you have one or more 8k RAM's on the "CARDBOARD/6", and the seventh switch is up (on), the VIC will "see" that RAM and move the screen. If, however, the switch is down (off), the VIC will power-up and not move the screen. The drawback to this solution is that you only have the original 3583 bytes of memory (6655 or a little less with the 3k or super expander) to work with. But this is the only way some poorly written programs will run.

SOLUTION #2. There is a program at the end of this booklet which will put the screen back at its original position and relocate basic to start above the screen RAM area. This will allow you to use up to 24k of RAM for basic programming with these poorly written programs; and it has the side benefit of protecting the RAM area below the screen from being overrun by basic, and that is the area where you store the special characters you design for your own games. Or you can store machine language subroutines there without fear of destruction or using any of basic's memory area.

SOLUTION #3. Additionally, there is a set of statements that will allow you to pre-program any programs that you write to run in any VIC memory configuration:

Make this one of your first program lines:

```
S = 4 * (PEEK (36866) AND 128) + 64 *
(PEEK(36869) AND 112) : C = 37888 + 4 *
(PEEK (36866) AND 128)
```

You can now peek or poke to the screen (no matter where it is) by using the variable S as the start of the screen memory locations and C as the start of the color memory locations. For example the third character location on the third line would be S+68.

If you plan to use a special character set several more steps will be necessary. This information is contained in the VIC-20 programmer's reference guide section on the "VIC" chip (pp 215).

Armed with all of this ammunition, you should be able to run just about any program on any memory configuration of a VIC-20. Remember, practice makes perfect. Try out a few of the programs you have. See which method works best for each program.

THIRTEEN DIP SWITCHES EXAMINED

It's time to deal with all those dip switches. There are two blocks of switches, with six switches in one and seven in the other (refer to figure 4). We have already discussed the odd seventh switch, so on to the remaining twelve.

But first, more tech-talk. We have described the 8k memory blocks as RAM areas 1, 2, 3 and 5. Any of these blocks can also accommodate ROM memory..... Wait a jiffy, what is this ROM memory stuff?

READ ONLY MEMORY (ROM)

Read Only Memory, (ROM for short), is the opposite of RAM in that it cannot be erased or modified by you and your VIC. ROM is used to store pre-programmed games and utilities. For example, there are ROMs inside your VIC-20 that contain the entire basic language you use for programming. Other programs like the VIC "PROGRAMMERS AID" cartridge come to you on ROMs. Any program that comes in a plug-in cartridge format will be in ROM. These ROMs will take up space in your VIC's available memory. For example, a ROM might be assigned by its designer to work in BLK 5. If you have anything in that block, it will have to go.

DIP SWITCHES
****

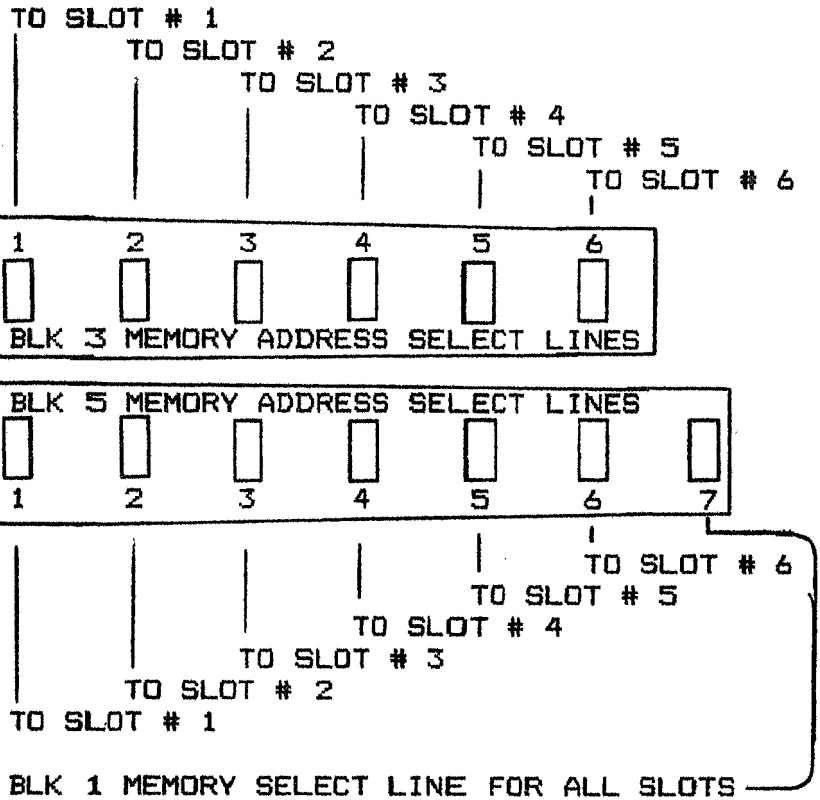
TO SLOT # 1
TO SLOT # 2
TO SLOT # 3
TO SLOT # 4
TO SLOT # 5
TO SLOT # 6
1 2 3 4 5 6
BLK 3 MEMORY ADDRESS SELECT LINES
BLK 5 MEMORY ADDRESS SELECT LINES
1 2 3 4 5 6 7
TO SLOT # 6
TO SLOT # 5
TO SLOT # 4
TO SLOT # 3
TO SLOT # 2
TO SLOT # 1
BLK 1 MEMORY SELECT LINE FOR ALL SLOTS

FIGURE # 4
****

It is a law of nature that you cannot have two things in the same place at the same time. This is also true of memory in the VIC-20. You cannot have two things in the same BLK at the same time. But wait, how can I have six games plugged into the "CARDBOARD/6" at the same time?

Remember this line: "The most valuable feature of the "CARDBOARD/6" (in our opinion) is its ability to switch select memory address lines"?

When you, through your VIC-20, call a ROM program, a group of address lines are turned on. This is how the VIC gets the information from a memory location. In the "CARDBOARD/6" we are able to reroute these lines manually, by the use of twelve dip switches; and that allows us to select one of several ROMs, or even RAMs, that would be assigned to the same location in the VIC's memory system without any conflict. Because, when the manually operated switch turns an address line off for a particular slot, the VIC can't "see" it, and, therefore, can't use it. So there is no conflict.

O.K. SO WHAT DO ALL THOSE SWITCHES DO

****

All plug-in cartridge programs that start automatically (i.e., games and utilities like the super expander, that you aren't required to do anything special to use.....in other words, "if it starts automatically when you turn on the VIC") must be in BLK 5, because that is the only place the VIC-20 looks for them. So, to allow you to switch between several of these games, all we need to do is allow you to turn on or off the address select line for BLK 5 to each slot on the "CARDBOARD/6".

The first six switches on the seven switch dip switch group do just that. Each switch 1 thru 6 feeds the BLK 5 address line to its respective slot 1 thru 6.

NOTE: Some plug-in games require that the switch directly above the BLK 5 switch be turned on also. So, if a game doesn't work right, try turning on that switch,too.

Remember....."you can only have ONE of those six switches on at any ONE time." Now is a good time to try out your newfound expertise!

Let us try a short exercise, you will need two or more game cartridges, or one game cartridge and the super expander (in all cases the super expander will be treated just like a game):

1) Turn off VIC.
2) Plug in as many of those auto start type games as you have. (If you have more than six, refer to the section on daisy chaining several "Cardboards".)
3) Turn all of the dip switches off.
4) Turn on VIC (you should get a XXXX BYTES FREE).
5) Select a game to play. Turn on its BLK 5 line by turning on the appropriate dip switch (1 thru 6 on the lower row of dip switches).
6) Push the RESET button on the "CARDBOARD/6".
7) Play the game.
8) Select a different game by turning off the switch now on - then turning on a switch that corresponds to the new game.
9) Go to step #6.

The BLK 5 select switches can also be used to place RAM memory in BLK 5. But as we described earlier, this memory block is not useable for basic programming.

WHAT ABOUT THE TOP ROW OF DIP SWITCHES?

The top row of dip switches control the BLK 3 address lines. As before, you can have only one of these switches on at a time.

Generally, the cartridges available at this time that utilize BLK 3 are utility programs like the Programmer's Aid cartridge or VIC-mon, the machine language monitor cartridge. If you are using one of these cartridges, you will be limited to using only two 8k or one 16k RAM cartridge, this will limit your basic programming area to 19xxx bytes free, because the next higher RAM would occupy the same memory location as the utility you are using in BLK 3.

That should give you enough information to start really getting the most out of your VIC-20.

DICTIONARY
****

DIP SWITCH:

Dual Inline Pin switch assembly - A switch or group of switches in a package of standardized size designed to be mounted directly on a printed circuit board.

MEMORY ADDRESS LINE:

The VIC-20 uses 16 Memory Address Lines to select which memory location it is accessing. Each line will be either on (1) or off (0). This provides a binary number in the range of 0000000000000000 to 1111111111111111 or, in decimal, 0 to 65535. For example, the binary number 0111000000000000 will access the first byte of information in the character generator ROM at location 32768. But 0110000000000000 will access the first byte of information in RAM BLK #3 at location 24576.

MEMORY BLK:

Or Memory Block, is a group of memory locations. For our usage in this text, we will refer to a BLK as a group of 8k (8k = 8192) memory locations.

PORT:

A point at which the internal workings of a computer can send information to or receive information from the outside world. The VIC-20 has several "PORTS" including the USER PORT, the GAME PORT and the MEMORY EXPANSION PORT. (also see slot)

RAM:

Random Access Memory - Memory used to store and retrieve information. Information stored in RAM can be altered and/or erased. (See text for more information).

ROM:

Read Only Memory - Permanent information storage. Information stored in ROM cannot be altered or erased by the VIC-20.

SLOT:

In normal use a slot is the equivalnt of a port. For our use in this manual we will intend a slot to mean one of the six female connectors (where you plug in a cartridge) on the "CARDBOARD/6". These are the electrical equivalent of the "MEMORY EXPANSION PORT" in the rear of your VIC-20

APPENDIX OF USEFUL INFORMATION
****

PROGRAM TO RELOCATE THE SCREEN

By: E.J. Lippert II

```
10 POKE 8192,00

20 POKE 44,32

30 CLR

40 POKE 648,30

50 POKE 36866,150

60 POKE 36869,240

70 PRINT "CLEAR/HOME"

80 NEW
```

NOTE: This program must stand alone; it cannot be part of another program.

THE USE OF RAM MEMORY IN BLK 5

Even if BLK 5 cannot be accessed by basic for programming, it can be a very useful warehouse for data. For example, you can peek at each location of the screen RAM and poke the entire screen into BLK 5 for safekeeping and recall it at any time. You can do this with the screen color RAM, too! There is enough room in BLK 5 to store 16 complete screens, or 8 screens with color information. This can be done with simple basic programming. However, if you used a machine language sub-routine to store and recall the screen, it would happen so fast that you wouldn't even see it change. This is how some arcade games achieve animation.

BLK 5 can be used to store any kind of data. In a program I wrote recently, which was to be used as a message center, each message was stored in BLK 5 and then retrieved as it was requested by the program. The messages could then be changed at will without alteration to the basic program. This also allowed over 8000 bytes of message storage without using any of the VIC-20's valuable basic programming area.

But remember...the only access to BLK 5 is through the basic PEEK/POKE commands, or machine language programming. In fact, the entire 8k can be used to store machine language programs and/or sub-routines. And that is exactly what the VIC Super Expander cartridge is...it is a bunch of machine language sub-routines (on ROM) stored in BLK 5.

The following program will demonstrate the use of BLK 5 RAM to swap and store two screens of information. Set up requires one 8k RAM assigned to BLK 5 (internal dip switch #1 on). Use the "CARDBOARD/6" to select the RAM on. All switches should be off except the one you are using to select the BLK 5 RAM.

Press reset, enter and save the program as shown. Load and run the program. Type in something then press the "f-1" function key. The screen will show garbage, clear the screen. And type in some more information. Now press the "f-1" key again, and you will see what you typed in on the first screen. The "f-1" key is now a switch to go from one screen to another. This system can be used for as many as 16 screens using just BLK 5. And if you are a real perfectionist you can use the same process to store the color information from it's location at 37888.

MACHINE LANGUAGE SCREEN SWAP PROGRAM
****

```
10 REM  E.J. LIPPERT II

20 X=48896

30 READ A: IF A=300 THEN GOTO 50

40 POKE X,A : X=X+1: GOTO30

50 POKE 36879,110:PRINT "CLR/HOME
   CTRL/WHITE"

60 Get A$: IF A$ = "" THEN 60

70 IF A$ <> CHR$ (133) THEN PRINT A$;:GOTO60

80 IF P=1 THEN P=0: SYS 48936: GOTO 60

90 P=1: SYS 48896: GOTO 60

100 DATA 162,0,189,0,30,157,0,161,232,208
110 DATA 247,189,0,31,157,0,162,232,208,247
120 DATA 189,0,163,157,0,30,232,208,247,189
130 DATA 0,164,157,0,31,232,208,247,96,234
140 DATA 162,0,189,0,30,157,0,163,232,208
150 DATA 247,189,0,31,157,0,164,232,208,247
160 DATA 189,0,161,157,0,30,232,208,247,189
170 DATA 0,162,157,0,31,232,208,247,96,300
```

DAISY CHAINING TWO OR MORE "CARDBOARD/6"'s

****

It is possible to link together two or more expansion units such as two or more "CARDBOARD/6"'s, or even one "CARDBOARD/6" and one "CARDBOARD/3".

This very simple process can add a lot of flexibility to your system, and should be seriously considered if you find yourself swapping cartridges a lot because you have too many cartridges and not enough places to put them. The addition of an inexpensive "CARDBOARD/3" will increase your slot count to eight available slots, adding a second "CARDBOARD/6" will up it to eleven slots available.

Daisy Chaining is accomplished by plugging a second board into any slot on the first, then turn on the BLK 3 and BLK 5 switches that control the slot used for the addition and turn on switch 7 on the added board (if it has one).

Daisy chaining is limited only by the ability of the VIC-20's power supply to keep up with the growing demand for power (see figure #5). But we have found that two "CARDBOARD/6"'s are well in range.

VIC-20 MEMORY EXPANSION POWER REQUIREMENTS

****

CARTRIDGE TYPE	REQUIREMENT
CARDBOARD/6	3 MILLIAMPS
3K RAM	4 MILLIAMPS
8K RAMs	5 MILLIAMPS
GAME ROMs	30 MILLIAMPS (standby)
	50 MILLIAMPS (working)
UTILITY ROMs	50 MILLIAMPS

According to the book "THE VIC REVEALED" published by Nick Hampshire Pubs., 750 MILLIAMPS is available at the port.

The power requirements listed above were determined by our own lab testing

WARNING: THESE FIGURES ARE FOR COMMODORE APPROVED DEVICES ONLY OTHER NONSTANDARD DEVICES MAY VARY SIGNIFICANTLY AND CAUTION SHOULD BE EXERCISED

FIGURE #5
****

TO THE BEST OF OUR KNOWLEDGE WHAT GOES WHERE
****

ANY CARTRIDGE WILL WORK IN ANY SLOT ON THE "CARDBOARD/6".

THIS SECTION IS DESIGNED TO TELL YOU WHAT ADDRESS LINES MUST BE TURNED ON TO ACCESS A PARTICULAR CARTRIDGE AND WHERE THE VIC-20 EXPECTS TO FIND IT.

3K RAM EXPANSION:

Goes in RAM 1, RAM 2, & RAM 3. No special requirements; its access is automatic. But, remember...it and the Super Expander cannot both be on "CARDBOARD/6"

SUPER EXPANDER:

Same as 3k RAM, but you must also turn on the BLK 5 switch if you wish to make use of the special commands.

8K RAM EXPANSION:

There is an internal dip switch inside the case of each of these cartridges. Refer to the instruction sheet that comes in the cartridge box. This internal switch group can have only one switch on at a time.

**** INTERNAL DIP SWITCH #4: Locates the RAM in memory BLK 1. You must have the "CARDBOARD/6" dip switch #7 on to use this BLK. This will give you 11xxx BYTES FREE.

**** INTERNAL DIP SWITCH #3: Locates the RAM to memory BLK 2. You must have an 8k RAM already in BLK 1 and the "CARDBOARD/6" dip switch #7 on to make use of this BLK. This will give you a "BYTES FREE" of 19xxx.

**** INTERNAL DIP SWITCH #2: Locates the RAM to memory BLK 3. You must have 8k RAMs in BLK 1 & BLK 2 and the "CARDBOARD/6" dip switch #7 on. AND you must turn on the "CARDBOARD/6" dip switch for BLK 3 (see figure #4, Page #9) for that slot. This will give you 28xxx BYTES FREE.

**** INTERNAL DIP SWITCH #1: Locates the RAM to memory BLK 5. You are only required to turn on the "CARDBOARD/6" dip switch for BLK 5 (see figure #4, Page #9) for that slot.

16k RAM EXPANSION:

This unit may contain up to two internal dip switches. Treat each one as a separate 8k RAM and proceed as per instructions for the 8k RAMs.

* SPECIAL NOTE: If your 16k has only one or even no switches it is safe to assume that the unswitched RAM is allocated to BLK #1. Or in the case of 0 switches BLK #1 & BLK #2

PLUG-IN GAMES:

All plug-in games that start up automatically will require that the BLK 5 dip switch for the appropriate slot be turned on (see figure #4, Page #9).

* ADDITIONALLY: Some of those games will also require that the BLK 3 dip switch be turned on, as well.

PROGRAMMER'S AID:

This cartridge resides in BLK 3 and will require that the BLK 3 dip switch on the "CARDBOARD/6" be turned on (see figure #4, Pg. 9). This will also mean that any other slot using BLK 3 must be turned off.

VIC-MON MACHINE LANGUAGE MONITOR:

Commodore seems to be rather confused as to where this cartridge belongs. The one I've got resides in BLK 3, but the instructions that came with it said that the normal location is BLK 5. Well, you can figure it out, I'm sure. If you've been reading carefully, you have all the information you need.

NOTICE:

This is the most accurate information available we have at this time. As new games and utilities become available they may require different memory locations than those listed here. The "CARDBOARD/6" will work with all the above listed cartridges and with some creativity on your part you should be able to utilize it with most of the soon to be introduced VIC-20 equipment.